REMARKS

In response to the aforementioned office letter, the applicant has carefully considered the rejection of the claims based on the Suciu et al. 5,000,859. As the Examiner may be aware this application was a divisional of a then co-pending patent application which matured into a U.S. Patent, namely U.S. Patent No. 6,770,483. In the parent patent application Serial No. 09/739,536 filed in December 2000, and which matured into the aforesaid Patent No. 6,770,483 the claims were similarly rejected on the basis of the Suciu et al patent. In that case the applicant then amended the claims to more fully define over Suciu et al., and the claims where then allowable.

The claims in this draft of this application are essentially similar to the claims in the aforesaid co-pending patent application and now U.S. patent, except that those claims where directed to a method whereas these claims are directed to the composition per-se. In addition, there is another unique facet proposed in the claims of the instant application and that is the fact that one can test water merely by dropping a tablet in the water to observe if there is a physically observable change. That change will not occur if the metal contaminant is not present but will occur when the pH is below 7.0 and the metal contaminant is present.

Notwithstanding the above, the applicant wishes to bring to attention the fact that there was another patent cited in the prosecution of the aforesaid parent patent application and that was the Aldrgie Patent No. 4,705,639. That reference is equally as relevant as Suciu et al. As was stated in the parent patent application, the applicant is Dr. Irving Lyon who is a very knowledgeable chemist having spent practically all of his adult life working in this field. Nevertheless, Dr. Lyon again wishes to emphasis that he is not an inventor of the fact that a reducing metal, such as cobalt or the like, can be used to reduce the oxidation state of chromium. He is also not the first to recognize the harmful effects of Chromium VI and the reduced toxicity presented by Chromium III. However, Dr. Lyon has found a very simple and highly effective way of detecting for the presence of Chromium VI or other oxidized metals.

In accordance with the techniques developed by Dr. Lyon, one who has absolutely no knowledge of chemistry would only have to drop a tablet into a sample of water and thereby test the water for the presence of a harmful metal consistent. All that the user has to do is to observe whether there is physical change in the water. It is, in effect, idiot-proof and if the users sees a color change or a percipient or both, then the user knows there is a harmful metal consistent present.

A careful reading of the Suciu et al. '859 patent will reveal that Suciu is primarily concerned with causing a reduction by means of a sulfide addition. For the sulfide addition to work properly, Suciu et al. must operate at a basic pH. In fact, with an acidic pH, it is highly doubtful that there will be much reduction of the metal contaminant. Suciu et al. even points out that hydrogen sulfide is the predominant specie at acidic conditions, while at neutral or alkaline pH conditions, the predominant species are HS and CrO_2^{-2}. In fact, Suciu et al. point out in column 2, lines 4-11 that the ferrous ion is essentially present to catalyze the sulfide reaction.

Suciu et al. actually point away from the use of the ferrous ion. Please see, for example, column 2, lines 4-12, in which Suciu et al. state:

> "The ferrous ion appears to catalyze the sulfide reaction. However, ferrous ion is not efficient by itself in reducing Cr^{+6} since only one electron is available per iron atom. A large quantity of iron hydroxide sludge is therefore produced. Ferrous ion and sulfide would appear to be the best combination for reducing and precipitating Cr^{+6} at neutral or near neutral conditions."

Thus, it can be observed that the ferrous ion is present to catalyze the sulfide reaction. Moreover, the sulfide reaction will occur at a pH greater than 7.

Please also see column 2, lines 60-67, in which Suciu et al stated:

> "In accordance with the foregoing principles and objects of the present invention, a process for treating industrial waste water containing hexavalent chromium (Cr^{+6}) and other heavy metals is disclosed which comprises reduction of Cr^{+6} to Cr^{+3} and the precipitation thereof with other heavy metals by addition of sulfide ion and ferrous ion to the waste stream at a pH of about 7 to 9."

It is interesting to note that although Suciu et al. state that the ferrous ions appear to catalyze the sulfide reaction, they do not offer any compelling data in either the figures or the table, or the text, or otherwise, to substantiate this conclusion. Rather, they state that the ferrous ion is not efficient by itself in reducing the chromium VI. They also state that as a consequence of using the ferrous ion as a reductant, a large quantity of iron hydroxide sludge is produced. See, for example, column 2, lines 7 and 8. From the above quotations, it can be observed that Suciu et al. clearly intended sulfides to be the reductant, and the ferrous

ions were added only to facilitate flocculation and precipitation of the suspended colloidal metal sulfide particles. Moreover, they produce this reaction at a pH in excess of 7.0.

Suciu et al. confirm that their primary object is to remove chromium and other heavy metals with a generation of a minimum amount of sludge. Please see, for example, column 2, lines 50 to 54. They are also concerned with the precipitation of the heavy metals by addition of the ferrous ion to the waste, and also at a pH of about 7 to 9. Suciu et al. add polymers to the solution to assist in flocculation and clarification of the waste stream.

Based on the foregoing alone, it is urged that Suciu et al. could not respond to the claims in the instant application. Applicant has carefully amended these claims to recite that the reducing agent becomes oxidized to a higher valence state. Even moreso, the claims have been amended to recite that change in the visual appearance will occur when the pH becomes less than 7.0, this being totally unlike Suciu et al. who operates at a positive pH greater than 7.0, namely 7 to 9. Consequently, it is believed that the claims in this application are patentably distinguish over Suciu et al..

In addition to the foregoing,, this claims in this application all recite that the physically observable change result form the presence of the metal contaminant. Moreover, the applicant has effectively called for the Redox reaction of both the oxidation and

the reduction in these claims. It is urged that Suciu does not respond to these limitations. In several of the claims, as for example, claims 61 etc. the Applicant states that pH in the body of the water avoids formation of a suspension which might otherwise obscure vision and to also provide stabilization of any reaction products. Suciu et al. are not concerned with avoiding a suspension in order to obtain an ability to observe a physical change in the body of water.

It is to be noted that the sulfide and the ferrous ions have a very high affinity for one another, and this is true, even over a wide pH range. Therefore, when they are both added to a stream of waste water, they are very likely to combine very rapidly to form a suspension of insoluble colloidal particles of ferrous sulfide, which are difficult to flocculate and precipitate. In fact, Suciu et al. recognize this phenomena, especially when they refer to the non-optimal sulfide-ferrous ratios which are used. They also identify the result which is black water. In column 7, lines 24-32, it is stated:

> "As suggested above relative to the EXAMPLE I tests, ferrous and sulfide ions in higher-than-optimal concentrations, although effective to a degree in reducing Cr^{+6}, result in black water (a fine suspension of FeS that does not filter out or precipitate with the floccules) and

corresponding high concentrations of soluble metals in the solutions."

Clearly, the inventors must recognize the inefficiency, both of the added sulfides as reductants, and as the added ferrous ions as flocculants and precipitants. However, there is a serious issue as to whether or not the Suciu et al. system is even operable. Unless very tight pH control and optimal concentrations of sulfides and ferrous ions are present, Suciu et al. is going to generate a great deal of these non-precipitable floc materials. Thus, in order to produce some efficiency, Suciu et al. must use non-stoichiometric amount of the ions in the waste water streams.

There is also a question about the effectiveness of the ferrous ions as flocculants and clarifiers, and even precipitants. If these ions were effective in precipitating in the colloidal flocs, one must inquire as to why it is necessary to add the polymers to assist in flocculation and clarification. This is an extremely important issue, although Suciu et al. remain entirely silent on this issue. Suciu et al. must recognize the difficulty they are creating, and the inefficiency of their system. A significant portion of the sludge would necessarily contain insoluble ferric compounds. The addition of ferrous ions to the waste streams as flocculants, clarifier or precipitants seems to be superfluous, especially when Suciu et al. are adding polymers to accomplish this result. Moreover, Suciu et al. must be careful to maintain pH levels that

facilitate flocculation and clarification and precipitation. However, they offer little in their patent. One must inquire as to the rationale or justification for the addition of ferrous ions to the waste streams.

It is to be noted in Suciu et al, from the above discussion, that Suciu et al. do not actually propose the use of the ferrous ions as a reductant, but rather as a flocculant and/or precipitant. Moreover, and even Suciu et al. recognize the black floc which is going to be created in the water. Consequently, the water will be sufficiently dark so that one will not be able to readily discern any real physical change in the water. Clearly, one will not recognize a color change which would normally occur from chromium VI to chromium III. This is due to the fact that there will be so much floc in the water, that it will be difficult to discern what is actually happening in the water itself. Moreover, special measures must be taken in Suciu et al. in order to create this precipitation, and to eliminate the floc in the water. It is for this reason that Suciu et al. use the polymer materials.

Sulfide and ferrous ions have a high affinity for one another, as aforesaid, over a wide pH range. As a result, when added to a stream of water, such as waste water, they will rapidly combine to form the suspension of insoluble colloidal particles of ferrous sulfide. In substance, the ferrous sulfide formation actually reduces the efficiency of the added sulfides as reductants, and for

that matter, the added ferrous ions, as precipitants. In other words, the entire system would fail in the absence of very tight pH control. In Suciu et al. the control of these parameters is not automatic, and moreover, they would not appear to be sufficient to control or minimize the problem Suciu et al. encounter. This is one of the reasons for having to add high and non-stoichiometric amounts of these ions to the water stream.

In view of the above, one must inquire as to what is the rationale or justification for the addition of the ferrous ions to the waste stream, when the reductants cited by Suciu et al. are apparently the sulfides. Suciu et al. actually answer this question: "It will be appreciated that the process is useful for any waste water containing appreciable amounts of heavy metal in order to minimize sludge generation." See, for example, column 3, lines 59-62 of Suciu et al. Suciu et al. even note that the reduction of the hexavalent chromium to trivalent chromium, while important in treating waste water, is not the primary point of the invention. See, for example, column 3, lines 62-66. In fact, Suciu et al. emphasize that the thrust of their invention is the treatment of metal bearing waste water, with lesser quantities of sludge being produced.

To emphasize with the very words used by Suciu et al., it is clear that any reduction of heavy metals, such as hexavalent chromium to trivalent chromium, is only incidental to the purpose

in adding the ferrous ions. The purpose of the ferrous ions in Suciu et al. is to facilitate sludge formation and reduce the amount of sludge ultimately formed in the waste water, with the sulfide acting as the reductant at neutral or near neutral pH's.

In contrast, the applicants have defined an invention which is significantly different. As indicated, the primary reductant in the instant application is the ferrous ion. The claims call for the fact that this reducing agent is responsible for substantially all of the metal contamination in the water. Secondly, the claims call for maintaining a pH substantially below 7.0. Obviously, in Suciu et al. the reaction using the sulfide as a primary reductant would not operate at a pH substantially below 7.0. Thirdly, the claims call for the fact that the change is physically observable, and provide a readily visual indication of the harmful metal constituent. By definition, if Suciu et al. has a black water problem, the change, and hence, the formation of the chromium III ion will not be physically observable. Consequently, it is believed that Claims 1-9 are allowable, and allowance therefor is respectfully solicited.

The Examiner did not actually cite the Aldrich Patent No. 4,705,639. However, Aldrich is also important as a prior art reference, since Aldrich discussed the combined use of the sodium sulfide as a primary reducing agent. According to Aldrich, metals in the waste water are converted into corresponding sulfides,

followed by treatment with the ferrous sulfate to provide ferrous ions. Aldrich notes that the amount of sludge produced is only about 25% of that previously produced, when the heavy metals were treated with ferrous ions under acidic conditions. In substance, it appears as though there is a serious ferrous sulfide precipitation problem when the sulfide ions and present ferrous ions are simultaneously introduced into the aqueous solution, and particularly over a wide range of pH conditions. It is clear that Aldrich did anticipate the combined use of the sulfide reductants and ferrous salts for removal of the toxic metals. There is nothing within the four corners of Suciu et al. that make it clear that the ferrous ions were required to achieve the results claimed.

In addition to the foregoing, claims 68-75 also recite a unique feature of this intention which is not remotely suggest by any of the prior art. These claims all call for the fact that the composition is tableted such that one may introduce a tablet into a quantity of the water in order to test for the presence of a hazardous metal salt. The Applicant has not broadly claimed a composition for testing for a hazardous substance, but rather has specifically claimed the composition in the form of a tableted composition for an identification of the metal contaminate even though broadly, and the fact that it is reduce to reduced the contamination. It is respectfully urged that the prior art does not even remotely suggest this type of tableted composition and as a

result, it is believed that these claims 68-75 are allowable and allowance therefore is respectfully solicited.

There is also a very serious question as to whether or not the process in the Suciu et al. reference is operable. Dr. Lyon, who has his PH.D., has analyzed the Suciu et al. reference carefully, and has determined that there is a serious question as to the operability of that process. In substance, the reason Dr. Lyon has concluded that there is some serious doubt about the operation of Suciu et al., is the mere fact that the sulfide ion and the ferrous ion have such a high affinity for each other, that in absence of proper pH control, which is necessary to preclude precipitation of the two as ferrous sulfide, the pH must be above 7.0. This would preclude any meaningful reduction with the ferrous ion. In order to analyze the Suciu et al. patent, Dr. Lyon has taken Figure 2 with Test Solution 5, and the electroplating solution in a waste water treatment plant for analysis. Inasmuch as the values plotted in those respective figures represent residual Cr^{+6} remaining in the solution after reduction to Cr^{-3}, Figure 8 of Suciu et al. shows the total chromium remaining in the solution is a function of ferrous concentration at various sulfide concentrations. It is therefore reasonable to assume that a decrease in chromium would result in a decrease in hexavalent chromium, especially in the presence of the reductants. Therefore, the values in Figure 8 were added to those of the other figures for analysis.

Dr. Lyon has further made charts and extrapolated by extending the linear segments of the lines to the horizontal axis. The combined tabulated data was compared to the values of the ratios of sulfide to chromium VI and ferric ion to chromium III. The comparison provided a valid basis for evaluating the major portion of the data upon which Suciu et al. rests their conclusions. To give Suciu et al. the benefit of the doubt, the experimental data was obtained in an adjusted pH range of 7.0 to 8.4. The combined values determined by Dr. Lyon are set forth in the attached Tables.

It can be observed from the attached Tables I and II, that either the values of the calculated ratios in Table II, in particular, appear to follow no particular pattern. A comparison of these ratios with those defining optimal process operating ranges of the invention, presented in Figure 12 of Suciu et al., show that only 21 of the sulfide hexavalent chromium ratios fall within the optimal range between 1.3 and 1.7. Similar comparisons for the ferrous hexavalent chromium ratios of Table II show that 12 of 21 of the ratios fall within the optimal range. It is therefore difficult to comprehend how Suciu et al. even claims his optimal range.

The applicant could literally submit an affidavit of Dr. Lyon to this effect, under 37 C.F.R. 1.132, if required. However, notwithstanding, there appears to be a serious issue as to the

operability of Suciu et al., and this should be taken into consideration when examining the applicability of this reference.

In view of the foregoing, favorable reconsideration and allowance is respectfully solicited.

Dated: April 23, 2008

Respectfully submitted,

ROBERT J. SCHAAP
Registration No. 20,577
Attorney for Applicant
(818) 346-6555

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to: MAIL STOP AMENDMENT, COMMISSIONER OF PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450 on 4/23, 2008.

(Signature) Date of Signature: 4/23, 2008

C:\Documents and Settings\All Users\Documents\Data\Lyon\Patents\10618385 CON '536 - ChildContinuity '311)\Amendment D.doc